

FORM PTO-1390 (Modified)  
(REV 11-98)

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

**TRANSMITTAL LETTER TO THE UNITED STATES  
DESIGNATED/ELECTED OFFICE (DO/EO/US)  
CONCERNING A FILING UNDER 35 U.S.C. 371**

66477-012-5

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR

**09/857348**

INTERNATIONAL APPLICATION NO  
**PCT/SE99/02255**

INTERNATIONAL FILING DATE  
**2 DECEMBER 1999**

PRIORITY DATE CLAIMED  
**3 DECEMBER 1998**

TITLE OF INVENTION

**ROBOT DEVICE**

APPLICANT(S) FOR DO/EO/US

**PERSSON, Fredrik; MIKAELSSON, Pierre; HVITTFELDT, Hakan; and LARSSON, Jan**

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:


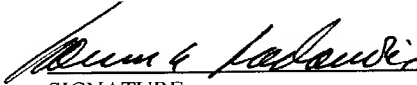
1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
  - a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☐ has been transmitted by the International Bureau
  - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ A copy of the International Search Report (PCT/ISA/210).
8. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
  - a. ☒ are transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☐ have been transmitted by the International Bureau.
  - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
  - d. ☐ have not been made and will not be made.
9. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
10. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
11. ☒ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

**Items 13 to 20 below concern document(s) or information included:**

13. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☒ A **FIRST** preliminary amendment.
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☐ A substitute specification.
18. ☐ A change of power of attorney and/or address letter.
19. ☐ Certificate of Mailing by Express Mail
20. ☒ Other items or information:

**WO 00/32363**

09/857348 JC18 Rec'd PCT/PTO 04 JUN 2001

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR 1.53) <b>09/857348</b>		INTERNATIONAL APPLICATION NO. <b>PCT/SE99/02255</b>		ATTORNEY'S DOCKET NUMBER <b>66477-012-5</b>																																																							
21. The following fees are submitted: <b>BASIC NATIONAL FEE ( 37 CFR 1.492 (a) (1) - (5) ) :</b> <input checked="" type="checkbox"/> Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO ..... <b>\$1,000.00</b> <input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO ..... <b>\$860.00</b> <input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... <b>\$710.00</b> <input type="checkbox"/> International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) ..... <b>\$690.00</b> <input type="checkbox"/> International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) ..... <b>\$100.00</b> <b>ENTER APPROPRIATE BASIC FEE AMOUNT =</b>				<b>CALCULATIONS PTO USE ONLY</b>																																																							
Surcharge of <b>\$130.00</b> for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input checked="" type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).				<b>\$1,000.00</b>																																																							
<table border="1" style="width:100%; border-collapse: collapse;"><thead><tr><th style="width:15%;">CLAIMS</th><th style="width:25%;">NUMBER FILED</th><th style="width:25%;">NUMBER EXTRA</th><th style="width:35%;">RATE</th></tr></thead><tbody><tr><td>Total claims</td><td>11 - 20 =</td><td>0</td><td>x \$18.00</td></tr><tr><td>Independent claims</td><td>1 - 3 =</td><td>0</td><td>x \$80.00</td></tr><tr><td colspan="3">Multiple Dependent Claims (check if applicable). <input type="checkbox"/></td><td>\$0.00</td></tr><tr><td colspan="3" style="text-align: right;"><b>TOTAL OF ABOVE CALCULATIONS</b></td><td><b>= \$1,130.00</b></td></tr><tr><td colspan="3">Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) (check if applicable). <input type="checkbox"/></td><td><b>\$0.00</b></td></tr><tr><td colspan="3" style="text-align: right;"><b>SUBTOTAL</b></td><td><b>= \$1,130.00</b></td></tr><tr><td colspan="3">Processing fee of <b>\$130.00</b> for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492 (f)).</td><td><b>\$0.00</b></td></tr><tr><td colspan="3" style="text-align: right;"><b>TOTAL NATIONAL FEE</b></td><td><b>= \$1,130.00</b></td></tr><tr><td colspan="3">Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable). <input type="checkbox"/></td><td><b>\$0.00</b></td></tr><tr><td colspan="3" style="text-align: right;"><b>TOTAL FEES ENCLOSED</b></td><td><b>= \$1,130.00</b></td></tr><tr><td colspan="3"></td><td style="text-align: right;">Amount to be refunded</td><td>\$</td></tr><tr><td colspan="3"></td><td style="text-align: right;">charged</td><td>\$</td></tr></tbody></table>				CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	Total claims	11 - 20 =	0	x \$18.00	Independent claims	1 - 3 =	0	x \$80.00	Multiple Dependent Claims (check if applicable). <input type="checkbox"/>			\$0.00	<b>TOTAL OF ABOVE CALCULATIONS</b>			<b>= \$1,130.00</b>	Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) (check if applicable). <input type="checkbox"/>			<b>\$0.00</b>	<b>SUBTOTAL</b>			<b>= \$1,130.00</b>	Processing fee of <b>\$130.00</b> for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492 (f)).			<b>\$0.00</b>	<b>TOTAL NATIONAL FEE</b>			<b>= \$1,130.00</b>	Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable). <input type="checkbox"/>			<b>\$0.00</b>	<b>TOTAL FEES ENCLOSED</b>			<b>= \$1,130.00</b>				Amount to be refunded	\$				charged	\$		
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<p><input type="checkbox"/> A check in the amount of _____ to cover the above fees is enclosed.</p> <p><input checked="" type="checkbox"/> Please charge my Deposit Account No. <b>04-2223</b> in the amount of <b>\$1,130.00</b> to cover the above fees. A duplicate copy of this sheet is enclosed</p> <p><input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. <b>04-2223</b> A duplicate copy of this sheet is enclosed.</p> <p><b>NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.</b></p> <p>SEND ALL CORRESPONDENCE TO:</p> <div style="border: 1px solid black; padding: 10px; width: fit-content;"><p><b>LAWRENCE R. RADANOVIC, ESQ.</b></p><div style="text-align: center;"> <b>25269</b> <small>PATENT TRADEMARK OFFICE</small></div></div>																																																											
			<div style="text-align: center;"> SIGNATURE</div> <div style="text-align: center;"><b>LAWRENCE R. RADANOVIC</b> NAME</div> <div style="text-align: center;"><b>23,077</b> REGISTRATION NUMBER</div> <div style="text-align: center;"><b>4 JUNE 2001</b> DATE</div>																																																								

66477-012-5

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	PATENT
	)	
PERSSON, Fredrik et al.	)	Group:
	)	
Serial No.: based on PCT/SE99/02255	)	Examiner:
	)	
Filed: June 4, 2001	)	ATTN: PCT

**Robot Device**

PRELIMINARY AMENDMENT

June 4, 2001

Box PCT  
Assistant Director for Patents  
Washington, D.C. 20231

Sirs:

Before examination, please amend the above-identified application as follows:

**IN THE CLAIMS:**

Please amend claims 1 to 11 as follows:

1. (Amended) Robot including at least one linkage device in which pull rods are arranged in a multi-joint system where the joints include three-axle ball and socket joints, wherein a bearing means is fixed so that the bearing means does not rotate in a housing in the socket of a joint, the housing including a surface against which the bearing means abuts and the surface being provided with friction-increasing means to increase friction between the surface and the bearing means.

2. (Amended) The robot according to claim 1, wherein the bearing means comprises an annular bearing means.

3. (Amended) The robot according to claim 1, wherein the friction-increasing means is structured as to penetrate bearing means effecting a permanent deformation.

4. (Amended) The robot according to claim 1, wherein the friction-increasing means comprise a plurality of grooves.

5. (Amended) The robot according to claim 1, wherein the bearing means abuts with the surface and is pressed thereagainst to fit tightly.

6. (Amended) The robot according to claim 4, wherein the grooves are oriented primarily parallel with the central axis of the bearing means.

7. (Amended) The robot according to claim 1, wherein the bearing means is comprised of a polymer material.

8. (Amended) The robot according to claim 1, wherein the robot comprises a delta robot.

Cancel claims 9, 10 and 11.

Add new claims 12, 13, and 14.

--14. A method for eliminating risk of play in a three-axle ball and socket joint in an industrial robot, comprising the steps of providing at least one linkage device for the robot, the device having pull rods arranged in a multi-joint system where the joints each comprise the three-axle ball and socket joint, providing a socket of the joint with a housing to accommodate a bearing means, providing the housing with a surface against which the bearing means abuts, fixing the bearing means such that the bearing means does not rotate in the housing, the fixing step being effected by providing the surface with friction-increasing means, and engaging the friction-increasing means with the bearing means when the bearing means is positioned in place.

13. The method according to claim 12, comprising the further step of pressing the bearing means to fit tightly in place in the housing of the joint socket.

14. The method according to claim 12, comprising the further step of deforming the material of the bearing means by permanent deformation by the friction-increasing means when the bearing means is placed in position.--

### **REMARKS**

Claims 1 to 8 have been amended to more closely conform the application to U.S. standards. Claims 9, 10, and 11 have been cancelled. Also new claims 12, 13 and 13 have been added. No new matter has been introduced, and all multiple dependent claims have been cancelled.

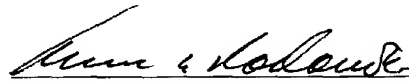
PCT/SE99/02255

Page 4

Attached is a marked-up version of the changes made to the claims by the  
current Preliminary Amendment.

Entry is believed in order.

Respectfully submitted,



Lawrence R. Radanovic, Reg. No. 23,077

Attorney for Applicants

ID38320

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"25269"

"Patent, Trademark Office"

**Versions with Markings to Claims to Show Changes**

1. (Amended) Robot including at least one linkage device in which pull rods are arranged in a multi-joint system where the joints include three-axle ball and socket joints, wherein [characterized in that] a bearing means [(3)] is fixed so that [it] the bearing means does not rotate in a housing [(2)] in the socket of a joint [(1)], the [where] housing including [(2) includes] a surface [(4)] against which the bearing means [(3)] abuts and [that] the surface being provided [(4) is designed] with friction-increasing means to increase friction between the surface and the bearing means [(5)].

2. (Amended) The robot [Device] according to claim 1, wherein [characterized in that] the bearing means [(3)] comprises an annular bearing means [(3)].

3. (Amended) The robot [Device] according to claim 1, wherein [claims 1-2 characterized in that] the friction-increasing means is structured as to [(5)] penetrate [its material by a permanent deformation of the] bearing means [(3)] effecting a permanent deformation.

4. (Amended) The robot [Device] according to claim 1, wherein [claims 1-3 characterized in that] the friction-increasing means [(5) are designed in the form] comprise a plurality of grooves [(5)].

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"Patent, Trademark Office"





surface against which the bearing means abuts, fixing the bearing means such that the bearing means does not rotate in the housing, the fixing step being effected by providing the surface with friction-increasing means, and engaging the friction increasing means with the bearing means when the bearing means is positioned in place.

13. The method according to claim 12, comprising the further step of pressing the bearing means to fit tightly in place in the housing of the joint socket.

14. The method according to claim 12, comprising the further step of deforming the material of the bearing means by permanent deformation by the friction-increasing means when the bearing means is placed in position.--

ROBOT DEVICE

## 5 TECHNICAL FIELD

The present invention relates to a device, use and method to eliminate the risk of play in a three-axle joint in a robot.

## 10 PRIOR ART

In a delta robot, a positioning of a moveable element in relation to a fixed element takes place (Fig. 5). Three driving means each drive their own link device arranged between the fixed and the moveable elements. The link devices can include rods arranged in multi-joint  
15 systems where the joints can comprise ball and socket joints.

The American document US,A, 4 976 582 shows, among other things, a delta robot with two parallel links 5a and 5b joined to pivot with ball and socket joints 26a, 26b, 27a, and 27b (Fig. 5). The joint sockets are attached to the ends of the links.

20

The ball and socket joints according to the invention are designed with replaceable bearing means that minimise friction in the joints. The bearing means has a socket-shaped inner surface and is manufactured in self-lubricating polymer material. The bearing means is arranged in a seat in the joint socket. During the operation of the robot, rotational  
25 movements take place in the ball and socket joints and directional movements also occur.

Problems arise when the bearing means follows the rotational movement, i.e. follows the rotation movement of the ball of the joint. In this situation, link movements take place at the same radii take place at the joint socket at each stroke of the linkage device, whereby  
30 wear occurs repeatedly at the same location. An uneven wear occurs in the joint, which causes play in the joint and thus increased friction in the joint. The reason that the bearing

means rotates with the ball joint is that the material in the bearing means is too soft to ensure a good tight fit in the seat.

5 A robot including a joint / joints with play does not work at a smooth pace but is disturbed in its movement as the joints bind and the movements become imprecise. The balance of moments in the construction is disturbed, which drastically reduces the working life of the robot. The cycle time increases and the robot cannot meet its performance requirements.

10 In the operation of robots, the need thus arises to firmly fix a bearing means in a seat in a joint socket. This need cannot be met by the delta robot in the American document.

#### SUMMARY OF THE INVENTION

15 When designing delta robots, the objective according to the invention is to achieve a design with a low weight that can handle a stroke time of 0.5 seconds. To achieve robots that are this fast, the joint must be designed so that friction is minimised.

20 A certain wear on the bearing means in a joint is unavoidable. An even wear of a self-lubricating bearing means gives an even lubrication of and a smooth movement in the joint. When the wear is even, no unwanted play occurs and the robot has a smooth, rapid operation.

25 The object of the present invention is thus to achieve a robot including a means with which one increases the friction between bearing means and socket in a ball and socket joint. An additional object of the invention is to design the device so that it allows an easy replacement of bearing means according to need.

#### DESCRIPTION OF THE DRAWING

30 The invention will be explained in greater detail by describing an example of an embodiment with reference to the enclosed drawings, where;

The housing 2 includes a surface 4 against which the annular bearing means 3 is pressed to fit tightly (Fig. 2). Annular bearing means 3 is manufactured from a polymer material and is pressed to fit tightly in place with the aid of a tool in the traditional manner. To increase the friction between surface 4 of the joint socket and the annular bearing means 3, friction-increasing means 5 are arranged on the surface 4. The friction-increasing means can be designed as, for example, a wave structure in the form of grooves 5' (Fig. 3). The orientation of the grooves 5' in a longitudinal direction forms the angle ( $\alpha$ ) with the centre axis (A) of the annular bearing means. Grooves 5' are preferably parallel with the centre axis (A). In addition, the grooves should have sharply pointed tops to secure the friction. When the annular bearing means 3 is arranged in the housing 2, the friction-increasing



## CLAIMS

1. Robot including at least one linkage device in which pull rods are arranged in a multi-joint system where the joints include three-axle ball and socket joints  
c h a r a c t e r i s e d in that a bearing means (3) is fixed so that it does not rotate in a  
5 housing (2) in the socket of a joint (1), where housing (2) includes a surface (4) against  
which the bearing means (3) abuts and that the surface (4) is designed with friction-  
increasing means (5).
2. Device according to claim 1 c h a r a c t e r i s e d in that the bearing means (3)  
10 comprises an annular bearing means (3').
3. Device according to claims 1-2 c h a r a c t e r i s e d in that the friction-increasing  
means (5) penetrate its material by a permanent deformation of the bearing means (3).
- 15 4. Device according to claims 1-3 c h a r a c t e r i s e d in that the friction-increasing  
means (5) are designed in the form of grooves (5').
5. Device according to claims 1-4 c h a r a c t e r i s e d in that bearing means (3) abuts with  
surface (4) and is pressed to fit tightly.  
20
6. Device according to claim 4 c h a r a c t e r i s e d in that grooves (5') are oriented  
primarily parallel with the central axis (A) of the bearing means.
7. Device according to claims 1-6 c h a r a c t e r i s e d in that the bearing means is made  
25 of a polymer material.
8. Device according to any of claims 1-7 c h a r a c t e r i s e d in that the robot is a delta  
robot.
- 30 9. Method for a robot including at least one linkage device in which pull rods are arranged  
in a multi-joint system where the joints include three-axle ball and socket joints and  
where a socket (1) of a joint is provided with a housing (2) to accommodate a bearing  
means (3), where the housing (2) is provided with a surface (4) against which the bearing  
means abuts c h a r a c t e r i s e d in that bearing means (3) is fixed so that it does not

rotate in housing (2) by providing surface (4) with friction-increasing means (5) that are brought to engage with bearing means (3) when bearing means (3) is positioned in place.

10. Method according to claim 9 characterised in that the bearing means (3) is  
5 pressed to fit tightly in place in the housing (2) of the joint socket (1).

11. Method according to claim 9 characterised in that friction-increasing means (5)  
deform the material of the bearing means by permanent deformation when bearing means  
(3) is placed in position.  
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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(71) Applicant (for all designated States except US): ABB AB  
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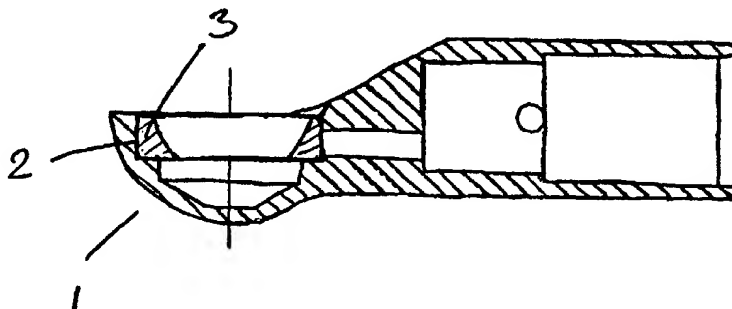
Published

With international search report.

Before the expiration of the time limit for amending the  
claims and to be republished in the event of the receipt of  
amendments.

In English translation (filed in Swedish).

(54) Title: ROBOT DEVICE

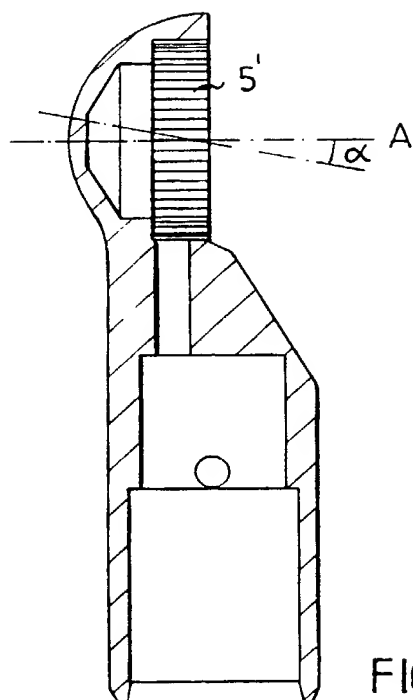
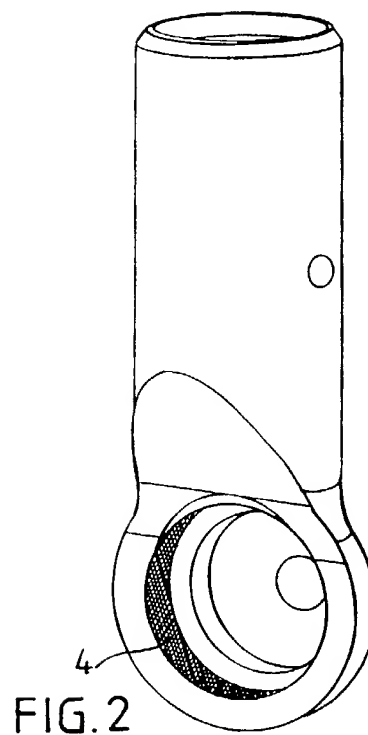
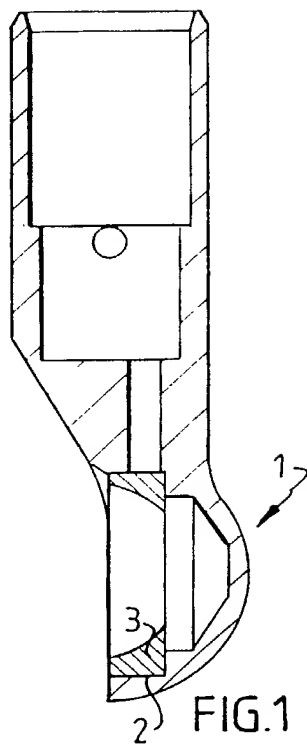


(57) Abstract

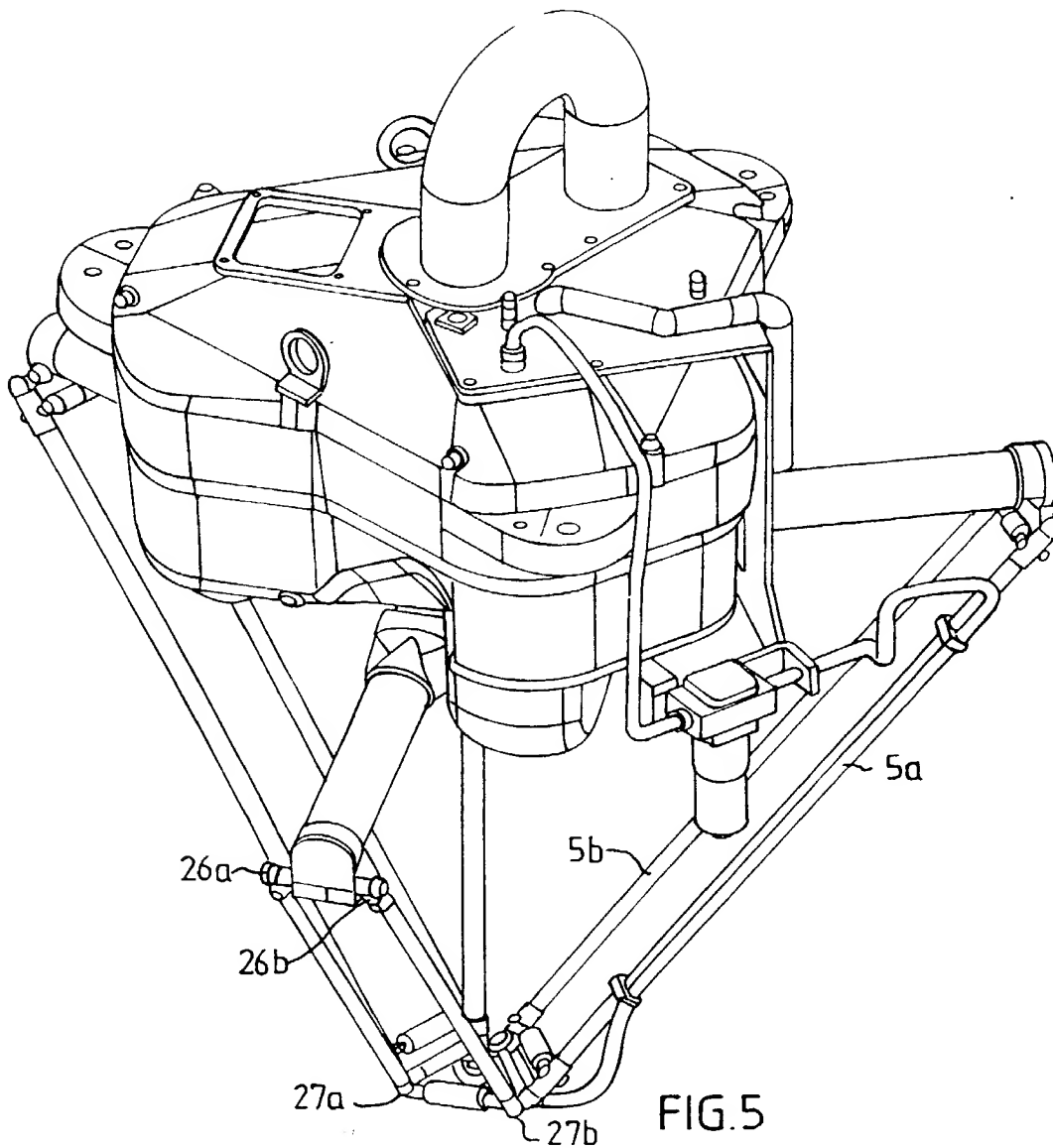
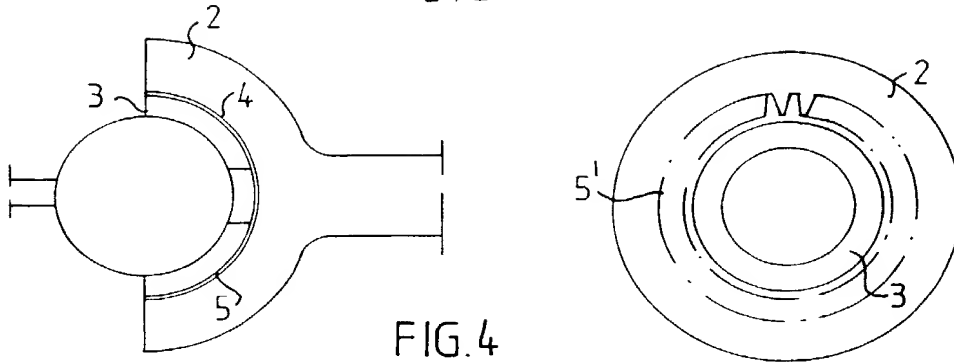
Device for fixing a bearing means firmly in a three-axle ball and socket joint arranged in a robot. The bearing means is arranged in a housing (2) on the joint socket (1) and the housing (2) includes surface (4) against which the bearing means abuts. Surface (4) is designed with friction-increasing means (5) that grip the bearing means and hold it.



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**COMBINED DECLARATION AND POWER OF ATTORNEY  
FOR UTILITY PATENT APPLICATION (Includes PCT)**Attorney Docket No.  
66477-012-5

As a below named inventor, We hereby declare that:

My residence, post office address and citizenship are as stated below next to my name; that

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural inventors are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

**ROBOT DEVICE**the specification of which (check one): ☐ is attached hereto.

☐ was filed on \_\_\_\_\_ as Application Serial No. \_\_\_\_\_ and was amended on \_\_\_\_\_.

☒ was filed on 2 December 1999 as PCT international application No. PCT/SE99/02255 and was amended under PCT Article 19 on \_\_\_\_\_ (if applicable).

We hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

We acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

We do not know and do not believe the claimed invention was ever known or used in the United States of America before my or our invention thereof, or patented or described in any printed publication in any country before my or our invention thereof or more than one year prior to this application, that the same was not in public use or on sale in the United States of America more than one year prior to this application, that the invention has not been patented or made the subject of an inventor's certificate issued before the date of this application in any country foreign to the United States of America on an application filed by me or my legal representatives or assigns more than twelve months prior to this application.

We hereby claim foreign priority benefits under Title 35, United States Code §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application(s) on which priority is claimed:

**Prior Foreign Application(s)****Priority Claimed**

<u>9804215-3</u>	<u>Sweden</u>	<u>03 / 12 / 1998</u>	<input checked="" type="checkbox"/> <input type="checkbox"/>
(Number)	(Country)	Day/Month/Year Filed	Yes No
_____	_____	_____	<input type="checkbox"/> <input type="checkbox"/>
(Number)	(Country)	Day/Month/Year Filed	Yes No

We hereby claim the benefit under Title 35, United States Code, §119 (e) of any United States provisional application(s) listed below:

_____	_____	_____	_____
Application No.	Day/Month/Year Filed	Application No.	Day/Month/Year Filed

Attorney Docket No. 66477-012-5

We hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) or PCT international application(s) designating the United States of America listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

Application Serial No.	Filing Date	Status (patented, pending, abandoned)
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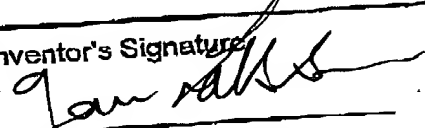
We hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith: Lawrence R. Radanovic, Reg. No. 23,077; Richard H. Tushin, Reg. No. 27,297; Donald N. Huff, Reg. No. 27,561; John P. DeLuca, Reg. No. 25,505; Charles Rutherford, Reg. No. 18,933; Robert L. Kelly, Reg. No. 31,843; Kevin M. Hinman, Reg. No. 35,193; Ernest E. Helms, Reg. No. 29,721; William F. Kolakowski, Reg. No. 41,908; Sandra S. Snapp, Reg. No. 41,444; and William A. Bonk, III, Reg. No. 40,251, all of Dykema Gossett, P.L.L.C. Direct all telephone calls to telephone no. (202) 522-8600 and faxes to (202) 522-8669.

Address all correspondence to Dykema Gossett, PLLC, Suite 300 West, 1300 I Street, N.W., Washington, D.C. 20005-3306.

We hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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Attorney Docket No. 66477-012-5

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